

High-Speed X-ray Imaging Program at the Advanced Photon Source

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The availability of x-ray sources such as the Advanced Photon Source (APS), with very bright beam, wide energy tunability and flexible storage ring filling structure, allows to push the limits on the speed of the traditional full-field phase-contrast imaging in terms of exposure time and repetition rate. We are currently limited by the state of the art of the high-speed digital cameras technology. We will present some examples of studies done with exposure time down to 100 ps and repetition rate up to ~ 0.27 million (true) fps, or 6.5 million (equivalent) fps. These include fluid dynamics singularities [1, 2], fuel injector inner dynamics [3], materials science applications such as rapid gas-less reactions propagation [4], and dynamic compression and shock physics [5].

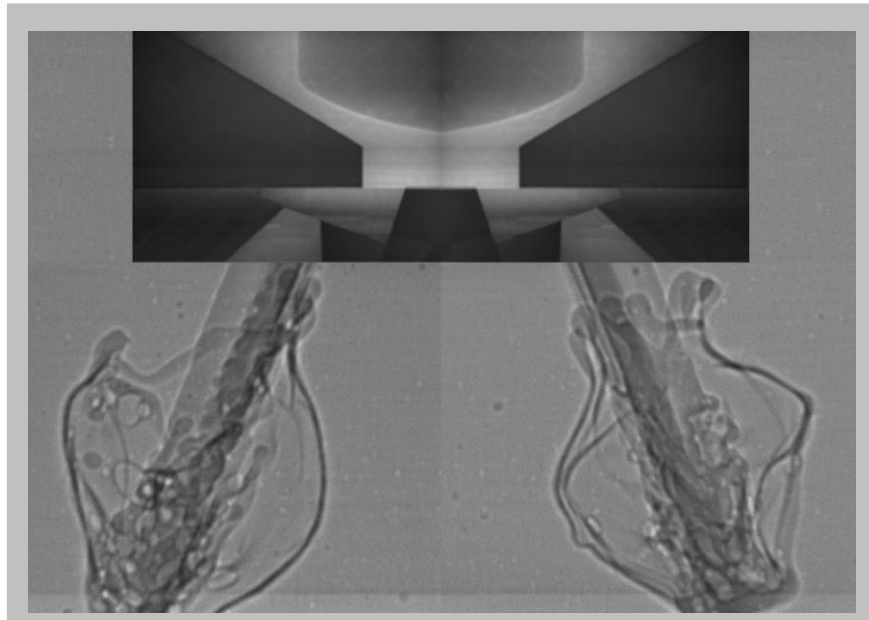


Figure 1: Composite image of a dual-hole fuel injector nozzle (top) and the fuel jets captured with ~ 500 ns x-ray pulse. The holes diameter is ~ 200 μm (from ref. 3).

References

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- [4] Reeves R.V. et al. PRB. 80, 224103 (2009).
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